

# Synthesis

EXPLORING RESEARCH • INSPIRING INNOVATION

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## Agriculture *of the* New Age

Institute of Tropical Agriculture  
and Food Security (ITAFoS)

MAPIM-KPM Award 2018  
Title: An Economic Valuation of Urban  
Green Space in Kuala Lumpur City

UPM Researchers  
Won 2 grants worth more than 5 million

Research Personality:  
PROF. DR. FATIMAH MD YUSOFF

Emerging Technology:  
Drone Spraying in  
Agriculture Production

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**A**GRICULTURE is one of the oldest and most fundamental primary occupation of mankind since the Stone Age. However, agricultural employment in Malaysia has gradually decreased from 26.55% in 1991 to only 11.4% today.

Factually, only 15% of the 800,000 farmers in Malaysia are aged below 40 years old, and 45% of them are aged 60 years and above. Megatrends like growing population, climate change, urbanization, and globalized trade are impacting agriculture. Nonetheless, agriculture is always at the heart of our daily lives. We need farm lands to grow food and survive. So, what does the future hold for agriculture? In this issue, we address new concepts in the new age of agriculture. This include recent technological development like utilization of drone for smart farming, crop growth enhancer, pest identification, sustainable agricultural method and urban farming which bring a breath of fresh air to this field.

The 'Cover Story' of this issue features the King of Fruit, Durian, which is arguably the most loved fruit among the people of our country. Not only that, it is quite popular among tourists, too, as its creamy butter-like custard flesh is just irresistible to be left untasted. In recent years, the global demand for Durian has been increasing. This is predicted to cause an undesirable rise in its price should there be a shortage of its supply. Hence, modern plantation systems have been implemented to enable the planting and monitoring of Durians in a larger scale. Growth factors like soil type, biotic-abiotic interaction and their effects on plant growth are also being closely monitored to ensure that our favourite fruit supply meets both local and global demands.

Technological advancement has shown to improve farm management of other crops as well. For example, in the effort to increase the country's rice self-sufficiency level, unmanned aerial vehicles (UAV) or drones are utilized. This has to potential to contribute towards food safety and security, along with reduced production cost. Changes as such will give readers a glimpse on how agricultural

management is changing in parallel to recent proliferation of electronics and computing technologies. Although it may take some time for our farmers to adopt these modern methods, with the appropriate exposure and education, we remain hopeful that the evolution is possible as it is necessary in overcoming issues like labour shortage and climate change.

In making agriculture to be efficient and insight-driven, the efforts and contribution from the Institute of Tropical Agriculture and Food Security (ITAFOS), and Smart Farming Technology Research Centre (SFTRC) are described in 'Research Highlights'. Both organizations are involved in researches relating to concepts of farm management using modern technology to increase both quantity, and quality of agricultural products.

UPM plays an active role in revolutionizing agriculture as well. Firstly, the university has initiated a number of outreach activities within this year to educate the community on modern agricultural techniques. In 'Reaching Out', UPM's joint efforts with corporations and schools in organizing knowledge transfer programs pertaining to the concept of greenhouse and urban farming are reported. Aside from that, UPM also contributes in terms of research. Young researchers of UPM today continue to explore new technologies and solutions in the agriculture industry by collaborating with an incredible range of tech-driven innovators. Machine Learning, Internet of Things, Biotech - these are just a few of the many exciting things we are looking at. May this issue be an eye-opener, if not, an inspiration to our readers. Happy reading!



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### Research Project

# Soil Fertility Status, Water Availability and Growth Performance of Durian (*Durio zibethinus* Murr) Cultivation in Gua Musang, Kelantan



### History

Musang King is undeniably crowned as a “premium” Malaysian brand. It has the perfect combination of bitter and sweet as well as rich in taste and colour. Its exotic flavour, unique fragrance, superior texture and nutritious quality makes it the most sought after variety among durian lovers.

By year 2030, durian production in Malaysia is projected to increase to 443,000 metric tonnes (4%) annually. Durian production in 2018 surged 61.9% to 341,000 metric tonnes as compared to 2017 of 211,000 metric tonnes. It shows that the demand for Malaysian durians, especially Musang King has increased significantly from the past decade and approval of frozen durian market access to China in 2007 is one of the main contributors to this phenomenon. The increase of forecasted production is due to the joint efforts of the Government of Malaysia, and the Government of China in signing the Durian Export Protocol to enable more durian products to be exported to China. Export of durian in 2018 worth of RM118 million, an increase of 67.25% against the previous year (RM70.68 million in 2017).

Thus, to tap into the potential of exotic topical fruits such as durian Musang King, M7 Plantation Berhad (M7) has conceptualised a unique 10,000 acres “Durian Valley” project in Gua Musang, Kelantan which is now being developed in stages.

### Establishment/ Objectives/ Future Planning of the Project Funder

M7 is a Malaysian public company registered in 2017. It consists of a passionate team in transforming traditional farms into modern business-driven plantations. The company has chosen Musang King D197 cultivation as the company’s primary business focus on a large scale. The business strategy is to develop Durian Valley into a model for modern farming that is cost efficient, environment-friendly, sustainable and the usage of technology-driven systems in trees production. M7 believes that the adoption of modern agricultural technology will result in greater farm-level efficiency, hence, delivering consistent quality produce to meet high global demand. M7 will continue to develop durian farming projects in the region of Kelantan and to expand into production of downstream products.



“The company has chosen **Musang King D197** cultivation as the company’s primary business focus on a large scale.”



## Project

In order to build its reputation in agriculture, M7 Plantation Berhad has engaged the Faculty of Agriculture, Universiti Putra Malaysia (UPM) as their collaboration partner due to UPM’s leading expertise in the field of agriculture in Malaysia. After several meetings and discussions, M7 has awarded the Faculty of Agriculture, UPM a research grant for a total of RM227,000 in November 2018 to work on a research project entitled “Soil Fertility Status, Water Availability and Growth Performance of Durian (*Durio zibethinus Murr*) Cultivation in Gua Musang, Kelantan”. This preliminary project will be completed within two years including a sponsorship for one master student.

This project will focus on the two important preliminary aspect as of durian cultivation which are the soil fertility status and water availability for sustainable durian growth.

A survey of soil fertility status would provide valuable information for diagnosis and prediction of durian fertilization needs to avoid overuse or inadequate use of fertilizer resources. However, improvement in nutrient use efficiency should not be viewed as fertilizer/fertility management alone. The process of nutrient accumulation or depletion are often related to transport processes of water. Therefore, water availability and survey are crucial to avoid water and nutrient stress at plant level. Finally, this project will also observe the growth performance of advanced planting materials (APM) durian seedlings under different fertilization regimes to see the potential of these planting material as one of the alternative to expedite durian growth and production. The future plan of the research collaboration is to develop internet of things (IOT) database for the durian industry.



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# Higher Institution Centre of Excellence (HICoE)

# Institute of Tropical Agriculture and Food Security (ITAFoS)

**The** Institute of Tropical Agriculture and Food Security (ITAFoS) envisions to be the focal point of impactful multidisciplinary research in improving food security. Since its establishment in 2007, we bring committed researchers and students together to practice agriculture science and innovate new solutions that may help in meeting the agricultural demand of this new era.

Our strong links with national and international universities, research institutions and industrial players are yielding success in achieving our goal as a premier institute for tropical agrifood and food security in Malaysia and across the region. We continue to seek new alliances with national and international collaborators to develop tropical agrifood production systems resilient to emerging challenges resulting from climate change.

There are three laboratories under ITAFoS, which are the Laboratory of Climate-Smart Food Crop Production, Laboratory of Sustainable Animal Production and Biodiversity and Laboratory of Food Safety and Food Integrity. The heads of the laboratories are Assoc. Professor Dr. Norida Mazlan, Assoc. Professor Dr. Awis Qurni Sazili and Professor Dr. Jinap Selamat, respectively.

On July 2019, two laboratories, Laboratory of Sustainable Animal Production and Biodiversity along with the Laboratory of Food Safety and Food Integrity, organized an outreach program called, "Science is Fun" with 60 indigenous Year 4 and Year 5 students from Sekolah Kebangsaan Bukit Tampoi (A), Dengkil, Selangor. Three main activities were carried out: "Good and Bad Bacteria" - led by Dr Anna Aryani Amir, "Junior Scientist" - led by Dr Noordiana Nordin, and "Egg Culture" - led by Dr Suriya Kumari Ramiah. Through these activities, the students were taught to culture and identify bacteria from hand prints, witness the hatching of a chicken egg using an egg



incubator, and also learn scientific methods to determine alkalinity, and acidity of foods. From their excitement and enthusiasm, students thoroughly enjoyed their time learning science in a fun way. The school administration gave great cooperation in facilitating the program, and ITAFoS will be coming again on the 1st of August, 2019 to conduct more interesting activities.

The Laboratory of Climate-Smart Food Crop Production also took a similar initiative by organizing a community program called, "Knowledge Technology Transfer of Fertigation Planting System" with students from the special education program (pelajar pendidikan khas integrasi) at Sekolah Menengah Kebangsaan Melor, Kota Bharu, Kelantan. The objectives of the program were to introduce a food crop fertigation system to the school, and provide long-term agriculture training for them to cultivate the crops and potentially for profit in the future. The knowledge and technology transfer was conducted within the span of 3 cycles; first cycle was an introductory session on the technology and its basic principles while the second and third cycle were to monitor the implementation of the technology. We believe the students benefited from the



program as they get to learn new knowledge and hands-on experience on modern agricultural techniques. Other research projects that have been carried out or are concurrently running under ITAFoS are:

1. Remote sensing with unmanned aerial vehicles: a game changer in precession agriculture;
2. Accelerating rice food security and enhancing the socio-economic status of rice farming communities;
3. Mitigation of enteric methane emission using naturally produced lovastatin;
4. Avian brain and a new understanding of brain evolution;
5. HAR-GoTM: HACCP Ready Go Board Game;
6. DNA Hybridisation: An Opportunity for Rapid Detection of *Vibrio parahaemolyticus*.



### Mission

To enhance sustainable tropical agriculture production and food security through effective, innovative and high impact research

### Objectives

1. To enhance multi-disciplinary research activities in selected focus areas through cutting-edge and knowledge intensive research.
2. To conduct research as a tool to solve problems and create solutions for income generation in the farming community.
3. To be recognized nationally and internationally as a research center of excellence in modern tropical agriculture and food security.
4. To offer postgraduate training programs in efforts to increase human capital.



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# Research Centre of Excellence (RCoE): SMART Farming Technology Research Centre (SFTRC)

**S**MART Farming Technology Research Center (SFTRC), formerly known as SMART Farming Technology Laboratory (SFTL), is among the research centre under the Faculty of Engineering, UPM. Since 2018, it has been recognized as a Research Center of Excellence (RCoE) by UPM's Research Management Centre.

SMART is an acronym that represents Scientific, Marketable, Affordable, Reliable and Time-saving, which are the driving aspects of farming technology used in agricultural production today. With that said, SFTRC focuses on exploring and implementing modern technology in farm management to solve current problems in the field. This includes the development of appropriate mechanisation, agricultural automation, smart cultivation practices, green and zero waste technology, GPS/GIS, remote sensing, soil scanning, agricultural informatics and Internet of Things.

The centre had made significant contribution in this area including the establishment of an ICT centre called Smart Farming Community Centre in Tanjung Karang Selangor, supported by the ICT section of the Ministry of Science & Innovation in 2005. Here, the researchers teach farmers in the community on the use computers and ICT to manage their farm. A custom website was built for the farmers to access fertility maps of their fields, and track their activities throughout the growing season. 30 farmers have enrolled themselves in this program, and in its nine years of operation, the area has improved its production from 4 metric tonnes per hectare to more than six metric tonnes per hectare. The group has published more than 568 articles in prestigious journals over the past ten years. It has successfully produced 182 postgraduates

in smart farming studies. The group has conducted contract research worth millions of ringgit at national and international levels, particularly in agricultural engineering and precision agriculture researches.

SFTRC immediate term plan will focus on constructive efforts in enhancing technological development, and innovation in Malaysia's agriculture through digitalization in the form of agricultural informatics. This include spatial data analytics, IoT, machine learning & artificial intelligence, and advanced sensing, technologies. This facilitates the promotion and the use of industrial revolution technologies for agriculture, building upon the university's reputation as an innovator in the field of precision agriculture. SFTRC actively engage with and work to provide a focal point for the industry; agriculturalists, technologist and investors to meet and source information, gathering and disseminating digital agricultural innovations from within the Malaysia and abroad. By the year of 2023 we aim to reach Higher Institution Centre of Excellence (HiCoE) status under the Ministry of Education.

### Mission

To build innovative technological solutions and services in agriculture through advanced research; developmental efforts; and technological diffusion in engineering and sciences.

### Current Project

SFTRC's current project focused on transforming agricultural activities to be more insight driven through the applications of digital technologies, advanced sensing, data analytics and artificial intelligence. Digital-based farm services would help to improve financial performance, reduce labour dependency, minimize chemical usage and boost yield. Factually, less than 10% of farms in Malaysia today are managed using digital technologies due to infrastructure constraints, lack of deliverability of technology know-how, and the need for regulation around the capture and exchange of data. For example, to help increase productivity and profitability. SFTRC proposed to combine digital, biotechnologies, big data analytics and scientific knowledge to create a smart platform for high value vegetable production. The smart farm is developed and equipped with the automation of nutrient mixing process. The nutrient fertigation system uses precise proportional valve with sensor-based control injection at predicted electrical conductivity (EC), and pH value followed by plant





nutrient uptake rate monitored in real-time monitoring. The information on nutrient supply to the crops according to their physiological stage of development, and consideration of the nutrient solution condition as well as climate characteristics will be analyzed and displayed on a cloud-based platform for easy remote monitoring. Scientific studies on plant pathological development and nutrient status in the farm will be explored via optical biosensors for sanitization management and disease control. The growth performance of the vegetable in complemented aquaponics solution is also explored. By leveraging bio-technologies, sensing technologies and data analytics, this platform can bring digital farming practices to the forefront of the Malaysian agriculture industry. It has the potential to radically redefine the role of farmers in adapting high technology for efficient agriculture production.



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By the year of 2023 we aim to reach **Higher Institution Center of Excellence (HICoE)** status accorded by the Ministry of Education

We have 16 associates, including researchers, research officer and junior associates. The associates are:

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- Encik Mohamed Azwan Mohamed Zawawi
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# Harvast™

## Carbon Quantum Dots Photosynthesis Enhancer

Photosynthesis is a process whereby green plants use light energy to convert water and carbon dioxide, into oxygen and sugar. Sugar is transported throughout the plant to tissues like leaves, roots, flowers and fruits for growth. Strategies to improve photosynthesis in order to improve crop yield is not new. This is because photosynthesis is well-known to



be a very inefficient process; typically converting only 2-4% of the available energy in radiation into new plant growth. However, the proposed conventional methods for photosynthesis augmentation typically revolve around complicated biotechnology and genetic engineering. Thus there is little surprise that not much practical advancements have been made in this regard. Harvast™, a novel invention based on the use of photoluminescent Carbon Quantum Dots (CQD), has been developed to provide a simple and safe solution to enhance photosynthesis. CQD which are fragments of carbon less than 10 nm, have photoluminescent properties very similar to chlorophyll, which are the green pigments responsible for photosynthesis. When Harvast™ is sprayed onto foliage, CQD penetrates leaves and interacts with chloroplasts (which contain chlorophyll). This interaction assists in the electron transfer mechanism of the photosystems, which leads to enhanced photosynthesis. Advantages of Harvast™ on plants include improved growth rate, hastened flowering, hastened fruiting and increased yield (for plants under optimum growth conditions).

Data analysis shows that improvement in photosynthesis afforded by Harvast™ is generally due to more energy produced by the plant, more carbon dioxide absorbed during photosynthesis, more efficient water usage, and less light required to achieve optimum photosynthesis rate.



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# BlastBuster RS4

The present invention is a green technology innovation consisting of an antifungal and growth-promoting preparation for coating plant seeds. It contains a natural biological control agent (BCA) and a natural resin as a sticker.

This technology is effective in controlling rice blast disease, promoting plant growth, while enhancing seed germination, yield and disease resistance. This product is in liquid form and meant as a seed treatment. Rice blast is a major fungal disease that causes substantial yield loss to the farmers if uncontrolled. The issue of farmers using chemical fungicides routinely and injudiciously to control rice blast disease is a great concern, because this practice causes health hazard to the farmers and environment. This green technology, on the other hand, is not hazardous to human



health, and is environmental-friendly which makes it a perfect substitute to chemical fungicides.

Another concern with conventional methods is the overuse of chemical fertilizers which potentially cause hazard to the natural soil structures and microbial communities in the soil. The adoption of this technology saves time and cost, while improving effectiveness in controlling rice blast disease and the health of soil and soil, microorganisms.

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# SAPPUTRA Nano-emulsion Formulation

Apple snails or *Pomacea* spp. originated from South America and it was first introduced to Asia in the early 1940s. It has been identified as a major threat to our rice industry and can cause serious damage or loss. The infestation occurs at the early stages of rice growth which is from day 0 to 27. It has been reported that 5 snails per 1 m<sup>2</sup> area are capable of destroying 100% of the rice seedlings.

As for now, chemical molluscicides are the most preferred control method to be used by the farmers against apple snail. Unfortunately, the use of chemical molluscicides are harmful to the environment in terms of residue and human health.

Therefore, SAPPUTRA has been developed to reduce the problems cause by chemical molluscicides and to control the apple snails. It is a green-technology innovation formulated using plant-based active ingredient which degrade easily into harmless compound and not persistent to the environment. It is also free from phytotoxic and contains nano particles that boost usage efficiency. It controls the pest by becoming an anti-feedant for the snails which eventually will result in their death through starvation.

This product was funded by the Long Term Research Scheme (LRGS) by Ministry of Higher Education (MoHE) in 2011, whereas the up scaling is funded through UPM through GPPI grant and Platcom Ventures Sdn. Bhd. This technology is a collaborative effort with AMCO Niaga Sdn. Bhd. The target customers of SAPPUTRA are relevant organizations and rice farmers.



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# Introduction

It was more than 39 years ago, in February 1980, that Prof. Dr. Fatimah Md Yusoff reported for duty as a young lecturer at the Department of Biology, Faculty of Science and Environmental Studies, UPM (then Universiti Pertanian Malaysia) after graduating with a Bachelor degree from Drew University, New Jersey in 1977, and a MSc degree from Michigan State University, USA, in 1979.

A year later she began to serve the newly formed Faculty of Fisheries and Marine Science (established in 1979), the place where she continued to work for more than 15 years before she returned to the Department of Biology (Faculty of Science) in 1996. During that period, she took a study leave to pursue her doctorate (1984-1987) at Michigan State University. Prof. Dr. Fatimah stayed true to her academic career in UPM, serving various Faculties (Faculty of Science and Environmental Studies, Faculty of Fisheries and Marine Science, and Faculty of Agriculture), a Centre (Research Management Centre) and an Institute (the Institute of Bioscience), in various capacities as a head of department, head of laboratory, deputy director before retiring as the Director of Institute of Bioscience from UPM.

With almost four decades of teaching and research experiences, Prof. Dr. Fatimah is an accomplished scientist in the field of Aquatic Science with a focus on Aquatic Ecology and Limnology. Her research deals with ecological studies and management of different aquatic ecosystems such as reservoirs, lakes, coastal waters and aquaculture systems with emphasis on biodiversity, live-feeds and applications of aquatic biocompounds, such as collagen and microalgae pigments in aquaculture and food industries.

### Her research projects won many national and international awards including:

01

The International Foundation for Science (IFS 2001 - Silver Jubilee Award)

02

International Trade Fair Ideas and Inventions-New Products, Germany (IENA 2006 - Gold Award)

03

The Invention New Product Exposition, Pittsburgh, USA (INPEX 2008 - Gold and Silver Awards)

04

Malaysia Technology Expo (MTE 2014 - Gold)

05

Bio-Innovation (Gold-2014)



Prof. Dr. Fatimah stands at the forefront in her field, applying fundamental knowledge in ecology and limnology to make the aquaculture industry a sustainable and productive venture, generating value-added processes and products along the way. Embracing the core values of integrity, passion for knowledge, innovation and growth, Prof. Dr. Fatimah was accorded many awards, and recognitions for her administrative, teaching and research works.

She inspired many students who since have graduated and gone to become accomplished academicians and scientists on their own rights. At this age, she can look back with great pride to see her students serving various institutions and agencies around the world, and some even have become very successful entrepreneurs.

## Spearheading Malaysia's Participation in International Research Projects:

**2017 - 2019**

Malaysia Nuclear Agency in the FNCA (Forum for Nuclear Cooperation in Asia), an initiative by Japan and led by Australia involving 10 countries on 'Mechanisms and Processes of Climate Change on Aquatic Environment using Nuclear and Isotopic Techniques'



**2019 - 2021**

IAEA/RCA RAS7031 program on 'Assessing the Vulnerability of Coastal Landscapes and Ecosystems to Sea-Level Rise and Climate Change' sponsored by the International Atomic Energy Agency and involving 15 countries with Australia as the lead country



**1996 - 2020**

European Union (EU ASIA-RESIST), International Foundation for Science (IFS, Sweden), Soka University, and Kindai University Japan (JSPS KAKENHI Grant and The Towa Foundation for Food Science & Research), in addition to millions of local research grants. As a Director, she led the Institute of Bioscience to be recognized as one of the first HiCoEs (High Institution Centre of Excellence) in the country with millions of research fund awarded between 2010-2012



Prof. Dr. Fatimah enjoys team work, and her contagious enthusiasm instills her and her team members with extraordinary energy and dedication to reach out beyond the ivory tower. Her team has collaborative research/programs/activities with Institutions and Agencies around the world, such as the World Fish Bangladesh; ASEAN-FEN on Fisheries Education Network; Asian Fisheries Society; World Aquaculture Society/Asia Pacific Chapter; Bangor University, UK; Russian Academy of Science; Moscow State University; University of Tokyo, Tokai University Japan; AEHMS (Aquatic Ecosystem and Health Management), Canada; and ANSTO (Australian Nuclear Science and Technology Organization), to name a few.

As an expert in her field, Prof. Dr. Fatimah is a sought-after reviewer and assessor by many publishers and agencies related to aquatic science and aquaculture. She served in the selection committee of EURASTIP (EU-Promoting Multi-Stakeholder Contributions to International Cooperation on Sustainable Solutions for Aquaculture Development In South-East Asia) program, as an advisor to IFS Sweden, and an editorial board member for various national and international journals. She is also

a consultant to several environmental and aquaculture related companies. She was appointed as a Technical Advisor on water quality management for Alam Sekitar Malaysia Sdn Bhd. (ASMA) from 2013 - 2020. Her contributions to the aquaculture industry are significant. She served as the Chairperson and Board of Directors of MAJUIKAN Fish Protect Sdn Bhd. She was a councillor and president of the Malaysian Fisheries Society (MFS) on various occasions since 1989, and was honored as the 'Industry Achiever' in 2006 by MFS. She was a councillor of the Asian Fisheries Society (AFS) from 2001-2011 and its Treasurer from 2007 to 2011. During her tenure as an AFS councilor, she helped to move AFS headquarters from Manila to UPM campus in 2008.

Prof. Dr. Fatimah's proficiency in aquaculture for sustainable food security, and aquatic ecosystem management for sustainable water security means that her expertise and services are still needed as these two sectors are essential parts of the 2030 Agenda for Sustainable Development (SDGs) adopted by all United Nations Member States in 2015, and the country's main socio-economic focus. She is still actively contributing to these sectors through her research,

consultancy and advisory activities in aquaculture and aquatic resource related industries to date.

### Q&A with Prof. Dr. Fatimah

#### 1. What is the most significant contribution you made to UPM in terms of research and innovation?

International projects garnered during my tenureship helped to improve research facilities (up-to-date scientific equipment), and human capital through research grants and training of young lecturers. Our publications in reputable international journals, patents and products, linkages and networking and participation in various programs/activities, locally and abroad propel UPM as one of the main global players in aquatic science.

#### 2. What is your most recent research project? How many projects have you successfully managed and which project you find interesting?

SATREPS (Science and Technology Research Partnership for Sustainable Development sponsored by JICA and JST) project on COSMOS (Continuous Operation System for Microalgae

Production Optimized for Sustainable Tropical Aquaculture) valued at > USD4 million, matched by the Ministry of Education RM7.55 million for a 5 year period 2016-2021 is the most recent mega project obtained. The shared patent by Soka University and UPM generated from this project has been used to set up a multi-million company in Japan (a Private and Government investment) in 2019, Bluescientific Shinkamigoto Inc., to produce a unique high-valued pigment, fucoxanthin from our isolate, a marine diatom, a world' first. The project will be duplicated later in Malaysia depending on the business climate.

### 3. What part of this field do you personally find most satisfying?

Working together in a happy team consisting of different but unifying expertise to solve important research questions/hypothesis can be really rewarding. The happiest times when we obtained meaningful outputs from our efforts. For example, the SATREPS-COSMOS Japan-Malaysia collaborative project was based on a humble paper published in 'Aquaculture' (a Q1 journal), (Yusoff, et al. 2001) and now the patent from the project has been used to develop a multimillion dollar company in Japan. In addition, research on marine organisms resulted in the development of marine collagen and gelatin with billion dollar market potential.

### 4. What is most challenging task in research?

Research is for inquisitive minds, and it is a must for companies, industries, agencies and institutions to rejuvenate innovation and technologies in order to stay competitive in business. The most challenging task is to be at the forefront, constantly generating novel ideas, and creating new and value-added products and technologies that are useful, valuable and commercialisable. However, it is not impossible to achieve this undertaking when we worked in isolation. The effort needs undivided commitment from everyone including the governing authority to ensure conducive research environment, state-of-the-art facilities and equipment, strong financial support and adequate manpower.

### 5. What kinds of expectation do you have for academicians pursuing a career in this field?

Excellent academic background, unceasing passion for science, sound research acumen as well as robust writing skill and talent are needed to stay afloat in this venture. Strong international linkage and networking help to enhance global collaborations and partnerships.

### 6. What personal qualities do you see as important for success in this field?

One has to stick to core values that provide direction



in our life journey and give meaning and happiness to our existence. Persistence, perseverance, dedication, diligence, sincerity, passion, enthusiasm, kindness and pleasant personality are necessary qualities to keep us going because success is not the end. It is the beginning of another successful endeavour.

## Research Achievements:

2013

Top research scientists Malaysia (TRSM) and a fellow of Academy Science of Malaysia (ASM)

Championed in two mega projects from Japan sponsored by JICA (Japan International Cooperation Agency) and JST (Japan Science and Technology Agency)

1998  
–2003

MASDEC (Aquatic Resource and Environmental Studies of the Straits of Malacca)

2016  
–2021

SATREPS-COSMOS (Continuous Operation System for Microalgae Production Optimized for Sustainable Tropical Aquaculture)

National Coordinator of JSPS-ACORE-COMSEA (Japan Society for the Promotion of Science Asian CORE Program - Establishment of Research and Education Network on Coastal Marine Science in Southeast Asia)

2012  
–2016

in collaboration with six countries in Asia (Indonesia, Japan, Malaysia, Philippines, Thailand and Vietnam)



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A peer-reviewed, open access journal

**Journal:**  
PLOS One

**Authors:**  
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Assoc. Prof. Dr. Farrah Melissa Muharram

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“government  
had allocated  
**RM1.8bil**  
in subsidies  
annually for  
about 200,000  
rice farmers.”

**Impact  
Factor:  
2.806,  
Q1 (2016)**



# PENYEK: Automated Brown Planthopper Detection from Imperfect Sticky Pad Images Using Deep Convolutional Neural Network

**Rice** is a staple food in Asia and it contributes significantly to the Gross Domestic Product (GDP) of Malaysia and other developing countries. Brown Planthopper (BPH) causes high levels of economic loss in Malaysia. Identification of BPH presence and monitoring of its abundance has been conducted manually by experts and is time-consuming, fatiguing and tedious. Automated detection of BPH has been proposed by many studies to overcome human fallibility. However, all studies regarding automated recognition of BPH are investigated based on intact specimen although most of the specimens are imperfect, with missing parts have distorted shapes. The automated recognition of an imperfect insect image is more difficult than recognition of the intact specimen. This study proposes an automated, deep-learning-based detection pipeline, PENYEK, to identify BPH pest in images taken from a readily available sticky pad, constructed by clipping plastic sheets onto steel plates and spraying with glue. This study explores the effectiveness of a convolutional neural network (CNN) architecture, VGG16, in classifying insects as BPH or benign based on grayscale images constructed from Euclidean Distance Maps (EDM). The pipeline identified imperfect images of BPH with an accuracy of 95% using deep-learning's hyperparameters: softmax, a mini-batch of 30 and an initial learning rate of 0.0001.

Accurate insect pest detection is very important in agriculture for the estimation of pest population density and dynamics in fields which allows for precision pesticide application. Due to the complex environment background of living pests, it is a big challenge to automatically identify them by image processing. The major challenge in the state-of-the-art automated system is to identify imperfect images. To replace human expertise and to overcome the aforementioned major challenges in the automated system, this study proposed an automated detection pipeline for Brown Planthopper in paddy fields called PENYEK. The PENYEK pipeline leveraged the architecture of VGG16 and Euclidean Distance Map (EDM) by applying the pre-trained weights and biases for classifying imperfect images. VGG16 network pre-trained on the large ImageNet dataset is fine-tuned to learn features of the BPH image dataset. The VGG16 architecture learned to identify BPH based only on positive and negative training samples. The insect pest images are in grayscale and achieves lower accuracy in RGB.

The first component of the proposed pipeline is image processing by applying binary filtering operations and other pre-processing techniques on image patches. From the performance of several CNN structures, EDM shows the best performance of all in term of accuracy. The second component is the VGG16 pre-trained architecture that has been fine-tuned to be trained in a small dataset. The performance of VGG16 architecture increases when fed with EDM images in term of accuracy, sensitivity, specificity and AUC. Moreover, the VGG16 architecture outperforms the state-of-the-art methods in image analysis in term of accuracy and AUC. All in all, qualitative and quantitative empirical results demonstrate the effectiveness of PENYEK pipeline on an insect pest image dataset

## Socio-Ecological Perspectives Of Engaging Smallholders In Environmental-Friendly Palm Oil Certification Schemes

**Palm** oil certification schemes have been developed to reduce further deforestation in palm oil producing countries. The schemes aimed to establish new plantations with improved agricultural practices in the tropics. Today, several certification schemes exist which guide consumers to purchase palm oil from more environmentally friendly plantations. Current schemes include the Roundtable on Sustainable Palm Oil (RSPO), Indonesia Sustainable Palm Oil (ISPO), Malaysia Sustainable Palm Oil (MSPO), and Good Agriculture Practice (GAP). Nevertheless, almost all existing schemes were developed by environmental NGOs, government agencies, and plantation companies with little input from the smallholders. This means that the inclusiveness of such certification schemes is limited to major players of the oil palm industry. The inclusion of smallholders into palm oil certification schemes is necessary as they constitute 40% of land use coverage for global palm oil cultivation. Therefore, there is an urgent need to understand smallholders' socio-ecological perspectives on the palm oil certification system to ensure the development of suitable certification schemes for them.

Our study aims to understand smallholders' perception, knowledge and attitude on farmland biodiversity as well as their expectation and willingness to participate in environmental-friendly palm oil certification. Three hundred independent and managed smallholders in Peninsular Malaysia were interviewed from January to February 2016. The study showed that the smallholder groups (more than 90% of the respondents) were keen to participate in the certification scheme if there is a premium pricing for oil palm yield and the certification cost is affordable. The study also indicated that smallholders need to be educated on biodiversity conservation and provided with financial and technical incentives to boost smallholders' participation. The paper concludes that understanding the socio-ecological background of smallholders is instrumental in designing a holistic certification scheme that will successfully conserve biodiversity in the agricultural production landscape without neglecting the plight of smallholders

- Majority of oil palm smallholders are not involved in certification schemes.
- Current schemes are developed with minimal smallholders' inputs.
- Smallholders are keen to join the schemes if there is a premium pricing for oil palm.
- Smallholders need to be educated on biodiversity and provided with incentives.



### Journal:

Land Use Policy

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3.089,  
Q1(2016)**



# Land Use Policy

### Urban Agrischool: Urban Agriculture Education through Greenhouse Concept

**URBAN** Agrischool was an initiative to educate students on the benefits and perks of urban agriculture. Among the objectives of this program includes changing the negative 3D perception on agriculture; which stands for Dirty, Dangerous and Difficult; to a more positive perception. It is hoped that this can be achieved through education on the importance of agriculture, current challenges in the field like food security, and the necessity in generating ideas



to solve these problems, not only as farmers but as agricultural engineers and scientists, too.

On the 9th and 10th of March 2019, the first Urban Agrischool program was held in Sekolah Kebangsaan Sedenak (SK Sedenak). The program was initiated by the Department of Biological and Agricultural Engineering, Faculty of Engineering, UPM in collaborations with Kulim (M) Berhad, Agri Space Tech Sdn. Bhd., Malaysian Society of Agricultural Engineers – Student Chapter (MSAE-Sc), SK Sedenak and SK Sedenak PIBG. Department alumni in both collaborator companies played a major role in making the program a success.

The program consisted of 3 main activities. The first activity, was to explore students' idea and creativity in designing greenhouses based on their own ideas without any prior reference. The students got to present and share their ideas while making constructive comparisons to other ideas presented by their peers. In the second activity, students were designed into groups to discuss the best greenhouse design, and build a model of it using available stationeries and recycled materials. Once completed, they were given the chance to share their creation. Lastly, the third activity was conducted by engineers from Agri Space Tech Sdn Bhd, where the students participated in an explorace type activity. Among others, they were educated on seed, planting, and pest through various activities.

A small group of students also had the chance to build an actual greenhouse using PVC pipes. A set of hydroponic planters were planted with Kailan seed, and the students were given the task to monitor the growth until harvest while recording growth data in the workbook provided.



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The next Urban Agrischool program will be held at one of the rural schools in Sabah this November (2019). To support, donate and participate, you may contact the director of Urban Agrischool, Dr. Anas Mohd Mustafah.

# Urban Farming with Maybank Helps Cultivate Survival & Entrepreneurial Skills

**URBAN** farming is becoming an important in our societies with the potential to address some of our most pressing challenges, including food insecurity, income generation, waste disposal, and urban insecurity. Seeing the importance of it, Maybank had launched an Urban Farming programme with the help of experts from Universiti Putra Malaysia (UPM) under the Ministry of Education's CEO@ Faculty programme 2.0. The Maybank Urban Farm serves as an effective solution to urban poverty, and enhance urban environmental management in areas such as resource conservation and waste management.

It is aimed at providing entrepreneurial skills to Maybank employees, encouraging them to appreciate the survivability of our biodiversity and ecosystem, and encourage the employees to be the voices of change among communities in greening the earth for a sustainable future.

The project initially took place at the Group's headquarters, Menara Maybank in March 2016. It was later expanded, thanks to the top management's sponsorship and their expanded interest in strengthening the value and impact from the program.

It was then relocated to Maybank Academy, Maybank's learning, engagement and knowledge hub located in Bangi with the inclusion of The Urban Farming Course.

The Urban Farming programme offered at the Maybank Academy is divided into three levels:

- Basic / Awareness – On the Fundamentals of Urban Farming.
- Intermediate – Introduction to Farming Technologies.
- Advance – Entrepreneurial modules plus Certification.

In 2018, a total of 239 and 145 Maybank employees attended the Basic and Intermediate courses, respectively. Participants were taught on the importance of urban farming and its benefits to individuals, households and communities.

Today at Maybank Academy, groups of employees spend their time on a weekly basis to learn how to sow seeds, transplant and take care of a few types of vegetables like Pak Choy, Chinese kale and water spinach. The vegetables are grown in a small area with an automatic



drip fertigation, vertical pots and vermicomposting system developed by UPM's agricultural and chemical engineering staff. The automatic drip fertigation system provides nutrient solution to around 400 plants grown vertically in pots in less than a 100sqft area. The food waste from the academy's cafeteria are utilised to produce organic fertiliser for the plants using the vermicomposting system, which uses specially bred worms to aerate the soil and convert organic matter from the food waste into compost. The vegetables will be harvested once every three weeks and donated to Rumah Pengasih Warga Prihatin, Sungai Ramal, an orphanage.

It has been a fruitful and rewarding experience for Maybank and UPM to see through the transformation of the Maybank Urban Farm from a small enclave of a few potted plants to what it is now – an epitome of an urban farm. According to Puan Nora Abd Manaf, Maybank's Group Chief Human Capital Officer, the Bank enables knowledge-sharing with UPM on the sustainable cultivation of food to mitigate the issue of the depletion of natural resources. This win-win project has continued to grow till today, and both organisations hope that the project will set an example for others to develop urban farms in their own organisations, and contribute to improving the access to fresh food for economically disadvantaged communities.



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### UPM Researcher Won Two Grants Worth RM5 million

Assoc. Prof. Dr. Natrah Ikhsan from the Department of Aquaculture, Faculty of Agriculture, UPM, who is also a fellow of CEO@ Faculty 2.0 under the AlxCHANGE Program and her research team, was recently awarded with two international grants worth more than RM5 million. The first grant was funded by the International Development Research Center (IDRC), Canada and UK's Global AMR Innovation fund (GAMRIF) on her project entitled, "The use of probiotics to reduce antimicrobial resistance in shrimp aquaculture." The second grant was from the European Union (EU) under the Trans-Eurasia Information Network (TEIN) program on another project of hers entitled, "Aquatic resource management in mangrove ecosystem via internet of things application," which is a collaborative work with Ericsson Malaysia and several universities in both Europe and Asia.

### UPM's *Pertanika Journal of Social Sciences & Humanities* won the Main Award at MAPIM-KPM 2018

Congratulations to the author of the paper entitled 'An Economic Valuation of Urban Green Spaces in Kuala Lumpur City' for the award. The author of the paper is Assoc. Prof. Dr. Abdul Rahim Bin Abdul Samad and co-authors Pn Nur Syafiqah A.Samad, Assoc. Prof. Dr. Mohd Johari Mohd Yusof and Prof. Dr. Katsuya Tanaka.

#### Summary of the paper

An economic value of urban green space (UGS) in Kuala Lumpur (KL) city has been estimated in this study. Global and local models were formulated based on hedonic price method. The global and local models were analysed using Ordinary Least Squares (OLS) regression and a Geographically Weighted Regression (GWR) respectively. From the OLS regression, it is observed that UGS in Titawangsa and Forest Research Institute Malaysia (FRIM) offer the highest economic value.

GWR, on the other hand, determines the effect of UGS towards the economic value of residential areas. Results conclude that only FRIM increases the economic value of all residential areas in KL city, while Titawangsa does not effect the economic value of certain residential areas like Mont Kiara Pines, Jinjang Selatan, Segambut Garden, Bandar Menjalara and Taman Bukit Maluri.

In summary, the economic value of those areas are influenced by other factors than UGS. This study offered good insight for real estate developers to target the best locations to develop residential areas. Besides that, the results also advocated for policy makers to protect UGS in the urban environment, and design zoning, as well as drafting of land-use regulation policies, accordingly.



From right: Prof Dr. Zulkifli Idrus (Deputy Vice Chancellor of Research and Innovation), Assoc. Prof Dr. Abd Rahim (author of the winning paper), Prof Dato' Abu Bakar Salleh (Chief Editor, *Pertanika Journal*), Puan Kamariah Saidin (UPM Press) at the MAPIM-KPM 2018 award ceremony



## Emerging Technology: Drone Spraying in Agriculture Production

Modern agriculture today is a highly competitive and globalized industry. With the help of technology, several operations in farm management have become more efficient and less cumbersome. Unmanned Aerial System (UAS), or also known as Drone, has been in the agriculture market for over 10 years. They offer accurate aerial mapping of vast lands and efficient spraying coverage which have made tremendous contribution in the operation of food production.

In Malaysia, the deployment of drones was firstly introduced by Syarikat Perniagaan Peladang Sdn Bhd (MADACORP), a subsidiary company under Muda Agriculture Development Authority (MADA). In 2017, the drones were deployed to spray pesticides across 2000 hectares of land owned by MADA as a pilot test on wetland rice field. Ever since its introduction, drones have become popular among farmers as they solve issues relating to labor shortage. Not only that, the technology opens a new job scope that is more appealing to the younger generation: farm drone pilot (as shown in the picture).

### Issues with Drone in Rice Field

One of the concerns from the paddy producers is the rice plant lodging, that could trigger huge yield losses. Rice lodging is a naturally occurring phenomenon that causes the grain to fall due to weak stems or harsh winds. As drones create heavy downwash and strong air turbulence, this may impose an unnecessary lodging issue and non-uniformity of chemical spray distribution. The effect is more severe and noticeable at the location where the drones take-off. The drone operator is advised to avoid low flying height of less than 2 m from the paddy field canopy.

### Future-planning

We are currently establishing centres to facilitate farm drone test runs. We hope to come up with standard guidelines for the incorporation of drones in our agricultural operations. Should you be interested to collaborate with us, do contact our project leader, Assoc. Prof. Dr. Ahmad Suhaizi Mat Su. We welcome any kind of collaborative work from the industry and government sectors.



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### Team Members

- Assoc. Prof. Dr. Norida Mazlan
- Prof. Ir. Dr. Azmi Dato' Yahya

# 40.7 million

Malaysia population in 2050

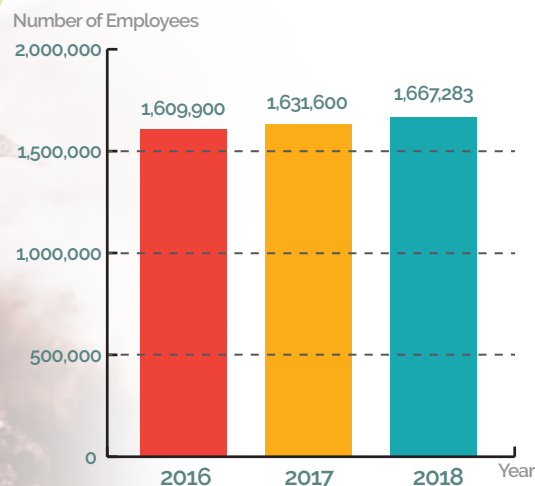


# 70%

Increase of food production by 2050

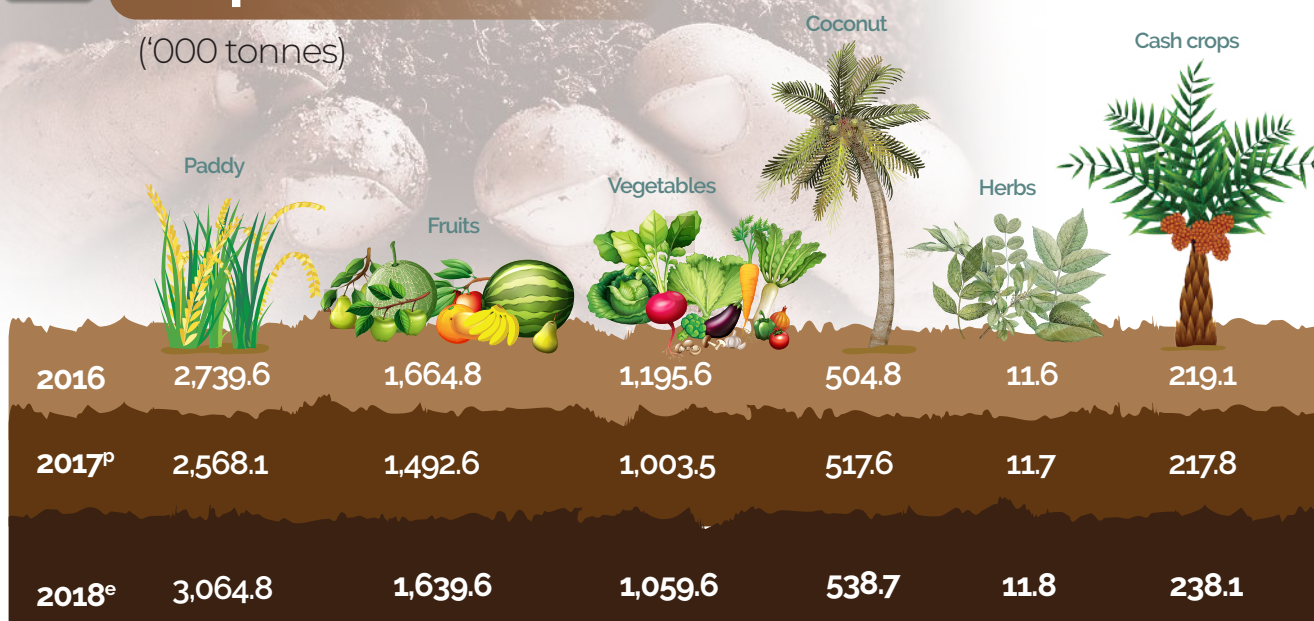


## Malaysia Employed Persons in Agriculture 2016-2018



## Malaysia Crops Production

('000 tonnes)



p: projected  
e: estimated

Source:

Current Population Estimates, Malaysia, 2018-2019. Department of Statistics Malaysia

<http://worldpopulationreview.com/countries/malaysia-population/>

How to Feed the World in 2050. UN Food and Agriculture Organization (FAO)

Pocket Stats Quarter 1 2019. Dept. of Statistics Malaysia

Selected Agricultural Indicators, Malaysia, 2018. Dept. of Statistics Malaysia

Statistik Makanan 2018. Dept. of Agriculture, Ministry of Agriculture and Agro-based Industry Malaysia

## MRV Jackets Improve Aid in Natural Disasters and Accidents

SERDANG, April 19: The innovative Medical Rescue Vest (MRV) safety jacket with 'three-in-one' function, can be provided immediately by rescue personnel to victims, during emergency response, and relief efforts during natural disasters and accidents.

The leader of the project Dr. Mohd Shahrizal Dolah, from the Department of Industrial Design, Faculty of Design and Architecture, Universiti Putra Malaysia (UPM) said:

"The objective of the MRV is to help rescue personnel to reduce fatality during operations at an early stage of natural disasters or accidents," he said.

"Any delay in providing medical assistance could be fatal to victims," he said while citing the Fire and Rescue Department of Malaysia 2015 report which stated that most fatality cases during natural disasters were due to delayed treatment.

The MRV jacket is equipped with first-aid kits on both sides of the jacket and is fully secured with zippers. Amazingly it can be turned into a stretcher with handles and the collar featured with a buoy.

The jacket is not only comfortable for its wearers, but also designed to function as first aid rescue equipment since there emergency treatment tools attached to it.

### COLOR CODING



According to Dr. Mohd Shahrizal in current rescue approach, the rescuer only wear regular safety jackets, while the medicines are carried by other medical personnel. As a result, even though arriving early at the location, rescuers have to wait for the medicines to be provided by the medical team.

Weighing at only 1.5 kg, the jacket is comfortable to wear and easy for rescue personnel to bring along during search and rescue operations. MRV won the silver medal at the Malaysia Technology Expo 2018.

MRV was developed by a graduate student, Juliza Jamian who is from the Industrial Design Department. The members of the research group were Assoc. Prof. Dr. Raja Ahmad Azmeer Raja Ahmad Effendi, Dr. Saiful Hasley Ramli and Shahrul Azman Shahbudin.



### FRONT AND BACK VIEW



“It can also be a stretcher”



## Outdoor Water Filter Innovation to Detect Chemical Pollution



SERDANG: Researchers from Universiti Putra Malaysia (UPM) present the Outdoor Water filter with SMART BEADS, an innovation to remove copper and heavy metals in water pipes in order to avoid excess copper ion in drinking water that may be harmful to human health.

Assoc. Prof. Dr. Janet Lim Hong Ngee, together with her co-researcher, Dr. Izwaharanie Ibrahim are the researchers and lecturers who developed the innovation. Both are from the Institute of Advanced Technology (ITMA), UPM. Dr. Janet

said that SMART BEADS do not only serve as the filter but also act as a photosensor electrode for detecting trace amounts of Cu (II) ions in real samples.

She said that copper is an essential element in the environment, and the human body because it helps the body to make red blood cells and keeps nerve cells, and the immune system healthy, but it cannot be used or consumed excessively.

She added that even though residences, offices, restaurants and

industries have water filtration devices at their premises, some Cu (II) ions are able to pass through the filters. As a result, the water that contains copper would be consumed by people.

She mentioned that the modified 3DE with SMART BEADS can provide a low-cost and environment-friendly solution without involving the use of expensive metallic current collectors, such as indium doped tin oxide (ITO) and fluorine doped tin oxide (FTO) glass substrates.

She also mentioned that the innovation can be applied in water treatment and purification systems, food and beverages, medicine, pharmaceutical and cosmetic industry.

The product received HOMEDEC's Special Award at the International Invention and Innovation Exhibition (ITEX) 2019; Research Entrepreneurial Award, Malaysia Commercialization Year (MCY) 2018; first prize at the National Nanotechnology Innovation Research Project Competition (PIN '18); and silver medal at the Invention and Innovation Competition of Private Higher Education Institution (PERINTIS 18).

## UPM recognises Outstanding Staffs

SERDANG, May 3 - Universiti Putra Malaysia (UPM) Registrar's Office, gave out awards to outstanding staffs in conjunction with the Gemilang Putra Ceremony (MGP) and Labour Day Celebration 2019.

"The ceremony was significant as it is a special platform for the university to show its recognition and appreciation towards the commitment of UPM staff, and officers for their outstanding performance throughout 2018 as well as those who have devoted their services to the university" said Prof. Datin Paduka Dato' Dr. Aini Ideris, UPM Vice-Chancellor.

"I hope the determination and sincerity of UPM staff and officers in carrying out responsibilities entrusted to them will encourage others to continue to provide the best service quality in all aspects," she added.

"Themed 'Pekerja Amanah Aspirasi Negara' (Trustworthy Workers Nation's Aspiration), the Labour Day 2019 celebration focuses on an important competency that must be embraced by every UPM staff and student.

Everyone must realise that a job is a responsibility that one needs to carry out to the best of the ability," she said.

The award categories given includes 'Anugerah Jasamu Dikenang' which was presented to four employees posthumously, the 'Outstanding Service Award' which was presented to 453 officers, the 'Jasa Putra Award' to 132 retired officers, the 'Setia Putra Award' which was given to 45 officers who have served UPM for 20 years, and the 'Bakti Putra Award' to 20 officers who have worked for UPM for 30 years.

In conjunction with the Labour Day celebration, six awards were presented. There were the 'Anugerah Tokoh Pekerja' for non-academic staffs which was awarded to Noorizai Mohamad Noor @ Mohamad, 'Anugerah Tokoh Pekerja' for academic staff awarded to Prof. Datuk Dr. Mad Nasir Shamsudin, 'Anugerah Tokoh Pekerja', Noor Mohamad Zin Mohamad Naim, 'The Longest Service Award (Non academic P&P)' which was given to Mokhtar Dahari, and last but not least, 'The Longest Service Award (Executive Officer)' which was awarded to Abd Talib Dollah.

## The First UPM Student Wins National Material Lecture Competition (MLC) 2019

MALACCA, 30 April – UPM PhD student won first place in the 2019 National Material Lecture Competition (MLC) with his lecture entitled, ‘DNA biosensor based on optical fiber for the detection of pathogen: A novel approach’. Lam Jia Yong, a 27-year-old student is the first UPM representative who made it to the final round and won the competition. In the semi-final, out of 15 participants from 15 local universities, he qualified to the semi final to participate in the final rounds, which was held at Universiti Teknikal Malaysia (UTeM), Malacca on 30 April 2019.

During the Finals, Mr. Lam Jia Yong managed to win the hearts of the jury and beat the other 4 finalists from Universiti Malaya (UM), Universiti Teknologi Malaysia (UTM), Universiti Malaysia Sabah (UMS), and Universiti Malaysia Kelantan (UMK). His supervisor is Assoc. Prof. Dr. Chee Hui Yee.

In addition, Lam Jia Yong will represent Malaysia at the Young Persons’ World Lecture Competition (YPWLC) organized by The Institute of Materials, Minerals, and Mining (IOM3), which will take place in London, England in October 2019.

The winner received RM3,000 in cash, certificate, and plaque. The MLC competition was introduced in 2012 by the Institute of Materials Malaysia (IMM) and IOM3 UK. This competition is an initiative intended to enhance awareness among young scientists and students in Malaysia on the importance of materials engineering and sustainability in the advancement of technology and humankind.



The Materials Lecture Competition (MLC) is open to any students in Malaysia (except academic staff) of age 28 or under on 1st June of the competition year. The participant must deliver a 15-minute presentation on a topic related to the Materials or Minerals Science and Engineering. The topic may cover the participant’s current research work or project from the following areas of interest (but not limited to) Materials Development, Characterization, Processing and Applications, Minerals and Geologically related disciplines.

His mentors, Dr. Norkhairunnisa Mazlan, Dr. Ahmad Salahuddin Mohd Harithuddin, Dr. Yasmin Mustapha Kamil, Dr. Mohd Salahuddin Mohd Basri, and Dr Ainun Zuriyati Mohamed@Asa’ari assisted and prepared him for the national competition.



## Seven Elected Academy of Science Fellows from UPM

KUALA LUMPUR, May 13 – Among the 27 newly appointed Fellows of the Academy of Sciences Malaysia (ASM), seven scientists and researchers were from Universiti Putra Malaysia (UPM).

ASM's fellowships consist of excellent scientists, technologists, engineers and social scientists who have made distinguished contributions in their relevant fields.

Individuals with outstanding merit, and high decorum integrity value with important features as ambassadors at the national and international levels, stand a chance for an annual nomination. Fellowships are chosen based on a stringent selection process covering seven disciplines. The newly appointed Fellows and their field's of expertise are as follows:

## 2019 FELLOWS

### *Congratulations*

#### Biological, Agricultural and Environmental Sciences



Prof. Dr. Abdul Rahman Omar  
(Faculty of Veterinary Medicine)



Prof. Dr. Raja Noor Zaliha  
Raja Abd Rahman  
(Faculty of Biotechnology  
and Biomolecular Sciences)



Prof. Dr. Tan Wen Siang  
(Faculty of Biotechnology  
and Biomolecular Sciences)



Prof. Dr. Tan Chin Ping  
(Faculty of Science and Food  
Technology)

#### Social Sciences and Humanities



Prof. Dato' Paduka Dr. Tengku Aizan  
Tengku Abdul Hamid  
(Faculty of Human Ecology)

#### Chemical Science



Prof. Dr. Khozirah Shaari  
(Faculty of Science)

#### Mathematics, Physics and Earth Sciences



Prof. Dr. Zainal Abidin Talib  
(Faculty of Science)

## ENHANCING RICE YIELD: USING ORGANIC AND INORGANIC AMENDMENTS

This book provides information on soil nutrient's fixation, losses and their availability in tropical soils. It discussed how rice growth is affected by availability of soil nutrients and their recovery on highly weathered acid soils. The significance of soil nutrients, an approach for improving soil nutrients availability, factors affecting nutrients availability in acid soils and the effects of organic and inorganic amendments on soil nutrients availability are discussed in this book. This book also focused on a series of laboratory studies, pot experiments and field trials conducted to evaluate the effectiveness of the use of organic and inorganic amendments in enhancing rice yield and soil nutrients availability. This book will be of benefit to agronomists, research scientist, farmers, students, fertilizer producers and others.

**Title:** Enhancing Rice Yield: Using Organic and Inorganic Amendments

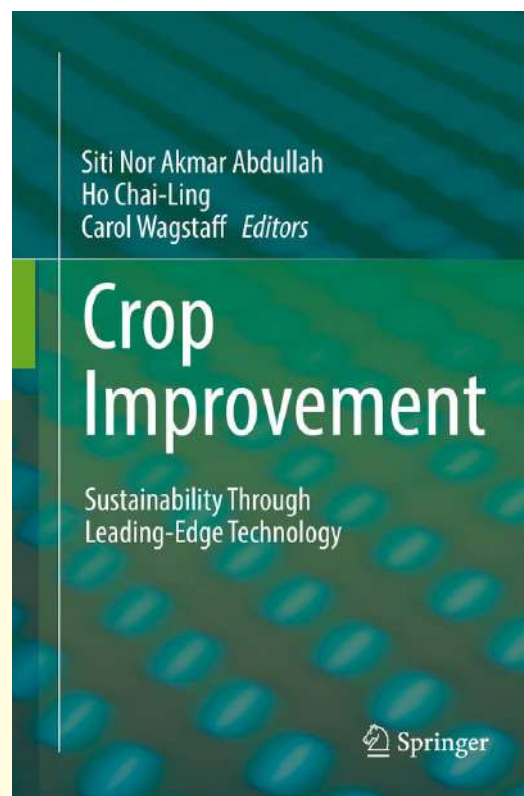
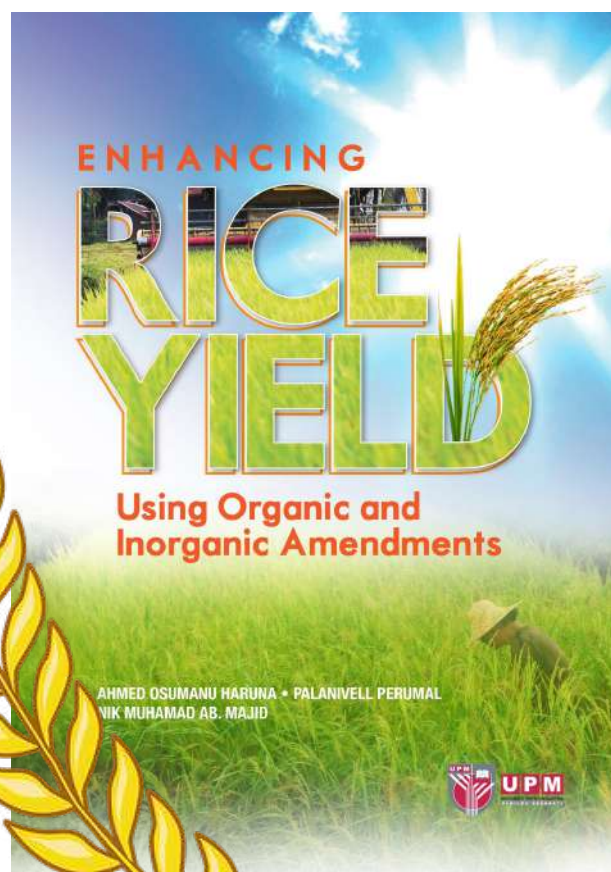
**Authors:** Ahmed Osumanu Haruna, Palanivell Perumal, Nik Muhamad Ab. Majid

**ISBN:** 978-967-344-754-1

**Price:** RM 64.00

**Direct order:**

UPM Press, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor.



## CROP IMPROVEMENT: SUSTAINABILITY THROUGH LEADING-EDGE TECHNOLOGY

Crop scientists should embrace new technologies in increasing yield, quality and improving food safety while minimizing adverse environmental impact of the agricultural activities. This book provides the latest development in the biosciences field covering key topics in crop improvement including 'omics approaches to improving sustainable crop production, advancement in marker technology, strategies in genetic manipulation, crop quality and sustainability and plant microbe interaction detailing on proven technologies to address critical issue for agricultural sustainability which are beneficial for researchers and students. The book also includes aspects of preserving crops after harvest as this is a key factor in promoting sustainable crop quality in terms of addressing waste, choosing the appropriate packaging and moving crops through the food and industrial supply chain.

**Title:** Crop Improvement: Sustainability through Leading-Edge Technology

**Authors:** Siti Nor Akmar Abdullah, Ho Chai-Ling and Carol Wagstaff

**ISBN:** 978-3-319-65078-4

**ISBN:** 978-3-319-65079-1 (eBook)

**Price:** USD 216 (Hardcover)

**Direct order:** Amazon.com

**Publisher:** Springer

# Synthesis

EXPLORING RESEARCH  
INSPIRING INNOVATION

*"And a sign for them is the dead earth-  
We have brought it to life and brought  
forth from it grain, and from it they eat"*

– (Qs, yassin 33)



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